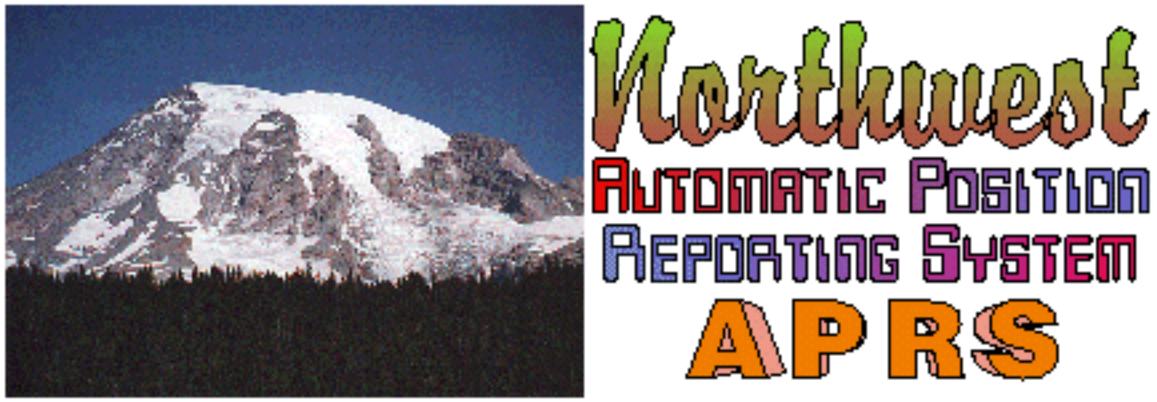


Automatic Position Reporting System (APRS)

Communications Academy

April 2-3, 2005

Bob King K7OFT

Thanks to Mike Heskett WB5QLD, Ralph Fowler N4NEQ, Tom Kinahan N1CPE and Dave Dobbins, K7GPS for their prior work on this presentation.

What is APRS?

- Automatic Position Reporting System
- A method of transmitting information on packet networks
  - Location of fixed resources and objects
  - Location, course and speed of mobile resources and objects
  - Weather data: wind speed, direction, temp, rainfall
- Information is displayed on a computer map
- Information can be logged and played back
- Great tool for public service, and disaster communications support and fun.

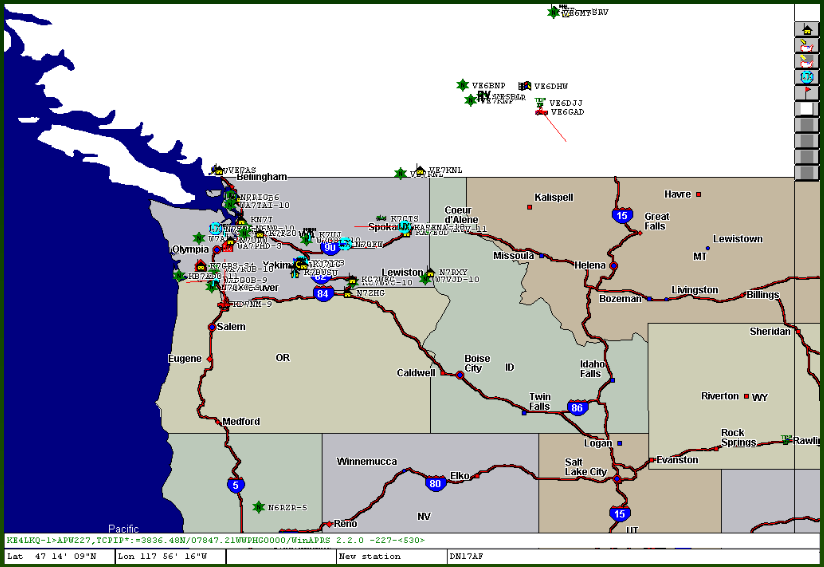
The Original APRSdos

- Developed by Bob Bruninga/WB4APR for the PC when he wanted a cost effective mapping program that would allow positioning of mobile stations using GPS receivers.

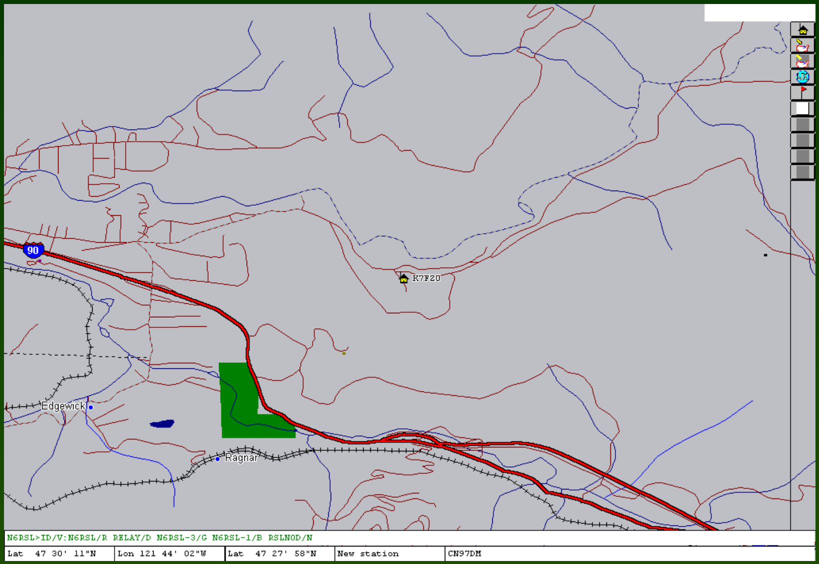
APRS Platforms

- First compatibility with DOS in 1992
- Macintosh version 1994
- Windows version 1995
    - Precision Maps integrated 1997
    - Street Atlas integrated 1998 (APRS+SA)
    - CE 2000 and now PocketPC
    - APRSPoint 2002 (Microsoft MapPoint)
    - UI-View32 (Precision Maps V7 integrated 2004)
- Palm OS version 1998
- Linux version 1999

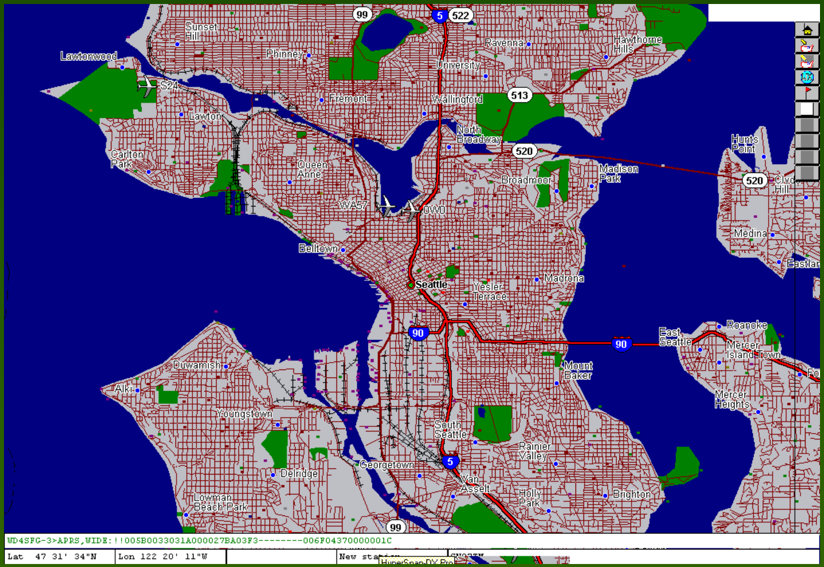
WinAPRS with Precision Maps – Great Detail



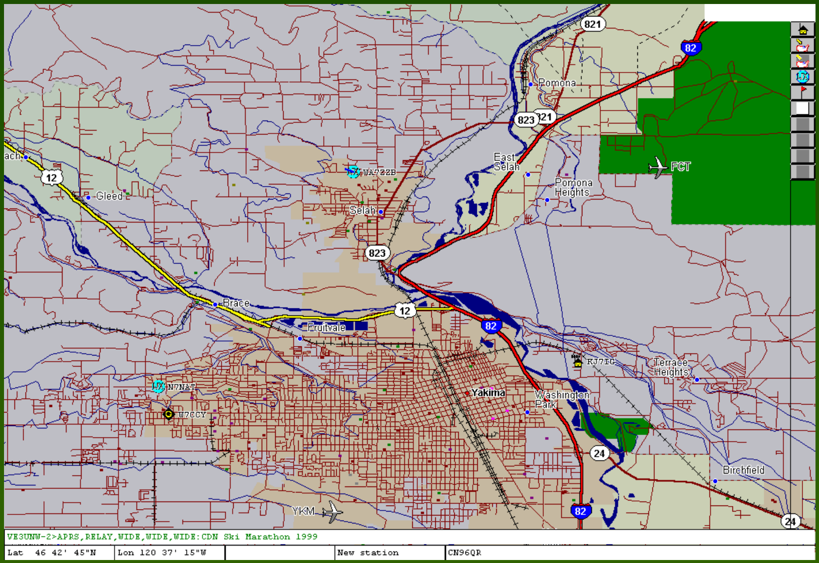
```
KE4LKQ-1>APW227,TCPIP*:=3836.48N/07847.21WWPHG0000/WinAPRS 2.2.0 -227-<530>
Lat  47 14' 09"N | Lon 117 56' 16"W |  | New station | DN17AF
```



```
N6RSL>ID/V:N6RSL/R RELAY/D N6RSL-3/G N6RSL-1/B RSLNOD/N
Lat  47 30' 11"N | Lon 121 44' 02"W | Lat  47 27' 58"N | New station | CN97DM
```



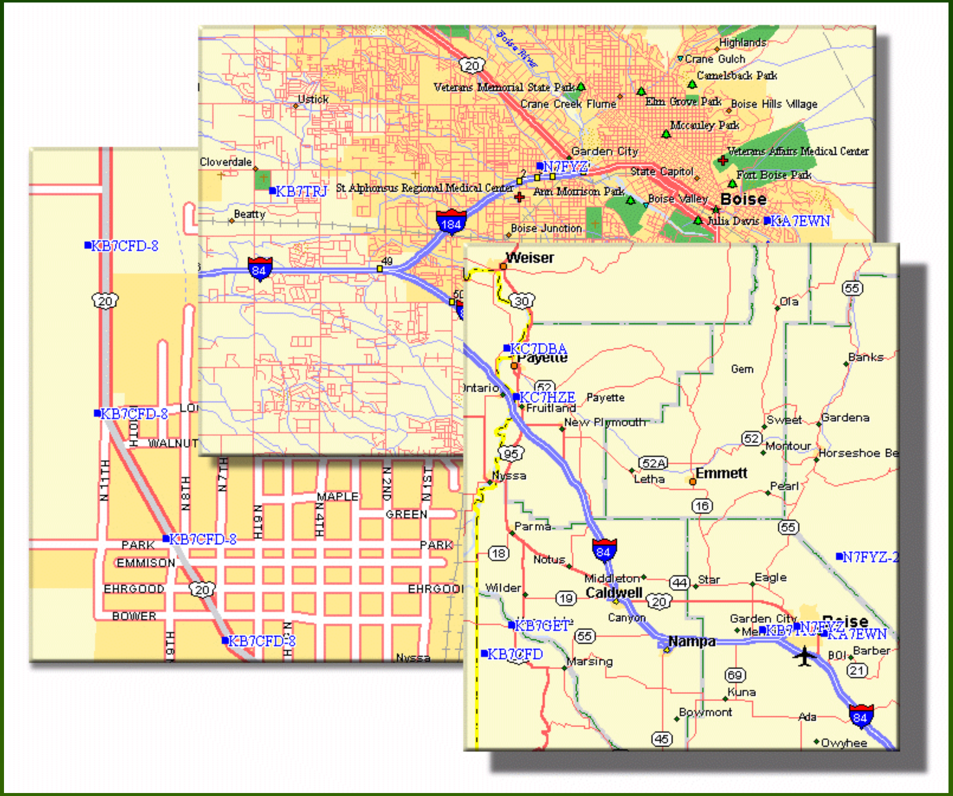
```
WD4SFG-3>APRS,WIDE:!!005B0033031A000027BA03F3--------006F04370000001C
Lat  47 31' 34"N | Lon 122 20' 11"W |  | New sta
```



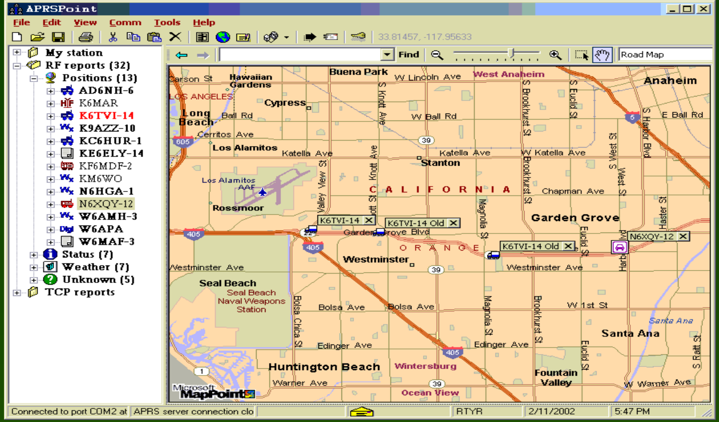
```
VE3UNW-2>APRS,RELAY,WIDE,WIDE,WIDE:CDN Ski Marathon 1999
Lat  46 42' 45"N | Lon 120 37' 15"W |  | New station | CN96QR
```

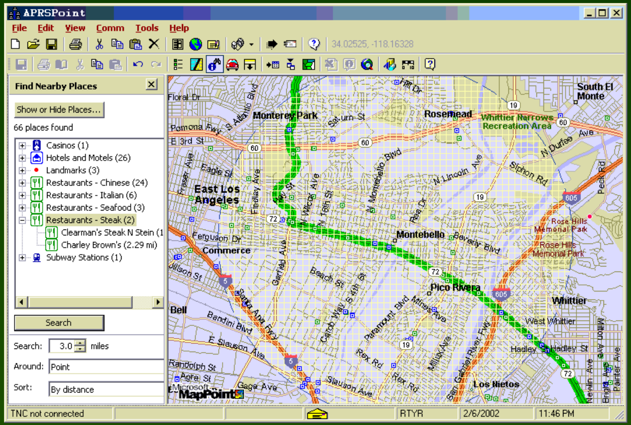
APRS+SA
(APRS + Street Atlas 4-9)

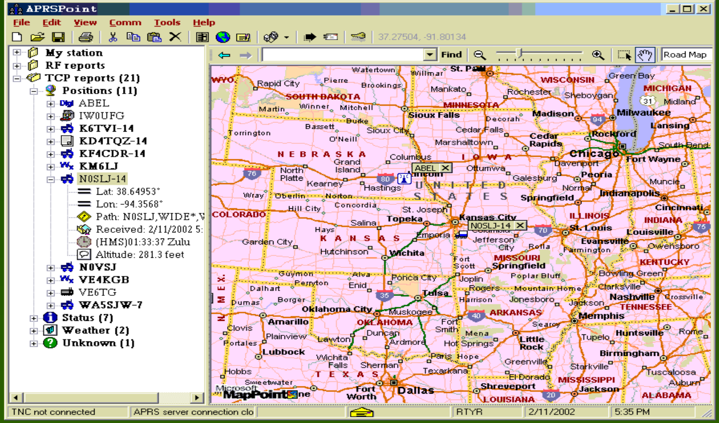
- Uses APRS+SA software as front end application
- Runs Delorme's Street Atlas maps on CD-ROM
- Great street-level maps
- Excellent application for EOCs who require detailed maps
- Higher learning curve than other APRS
- Alternative to running WinAPRS/PMaps.

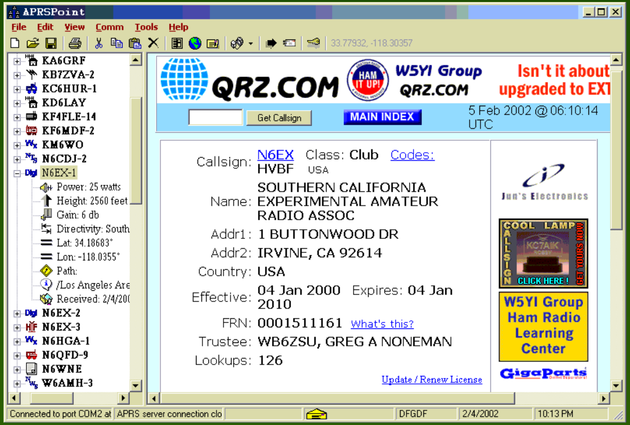


APRSPoint & Microsoft MapPoint









N6EX-1
Power: 25 watts
Height: 2560 feet
Gain: 6 db
Directivity: South
Lat: 34.18683°
Lon: -118.0355°
Path:
/Los Angeles Are
Received: 2/4/200

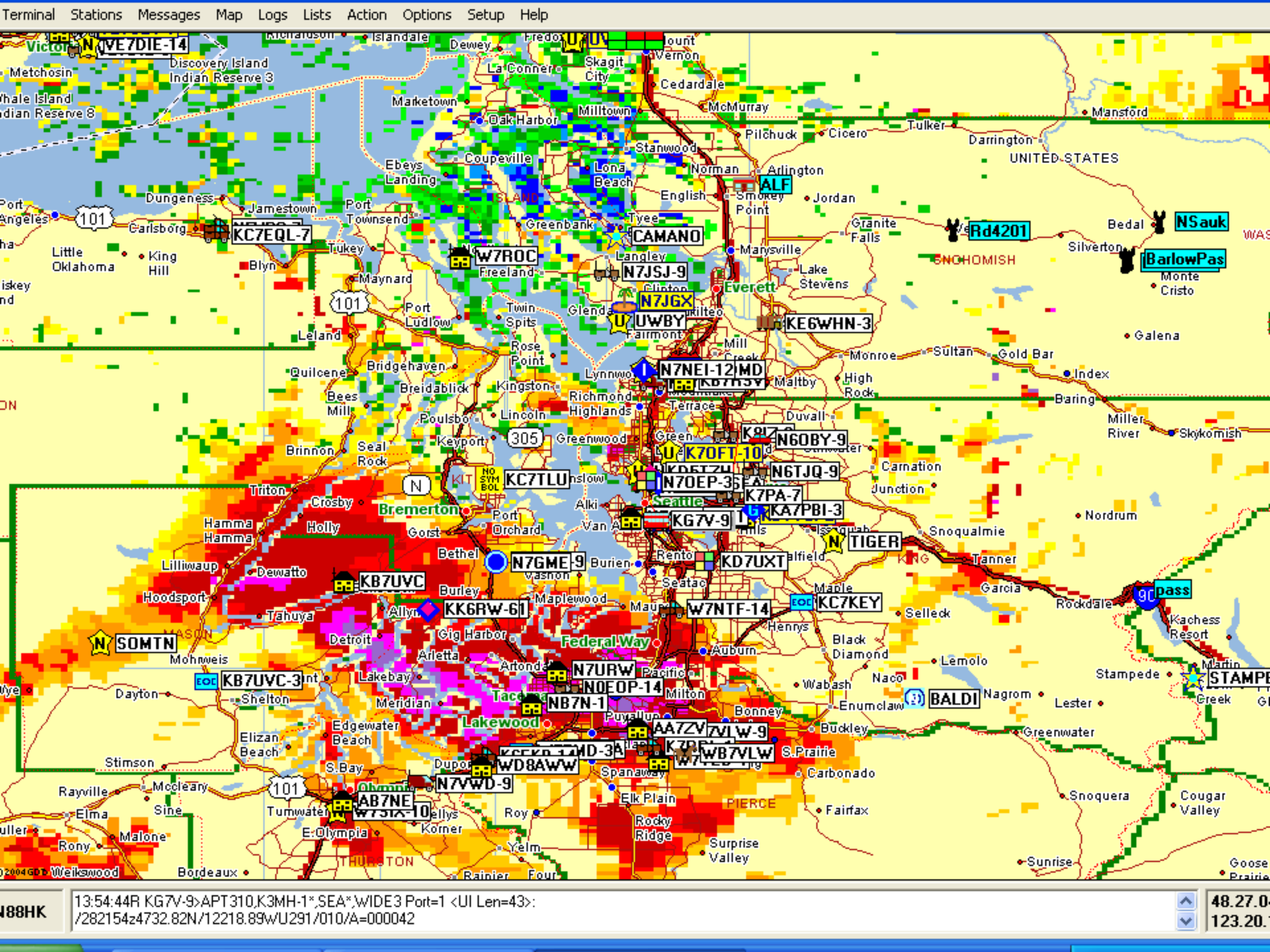
5 Feb 2002 @ 06:10:14 UTC

Callsign: N6EX Class: Club HVBF USA
Name: SOUTHERN CALIFORNIA EXPERIMENTAL AMATEUR RADIO ASSOC
Addr1: 1 BUTTONWOOD DR
Addr2: IRVINE, CA 92614
Country: USA
Effective: 04 Jan 2000 Expires: 04 Jan 2010
FRN: 0001511161
Trustee: WB6ZSU, GREG A NONEMAN
Lookups: 126

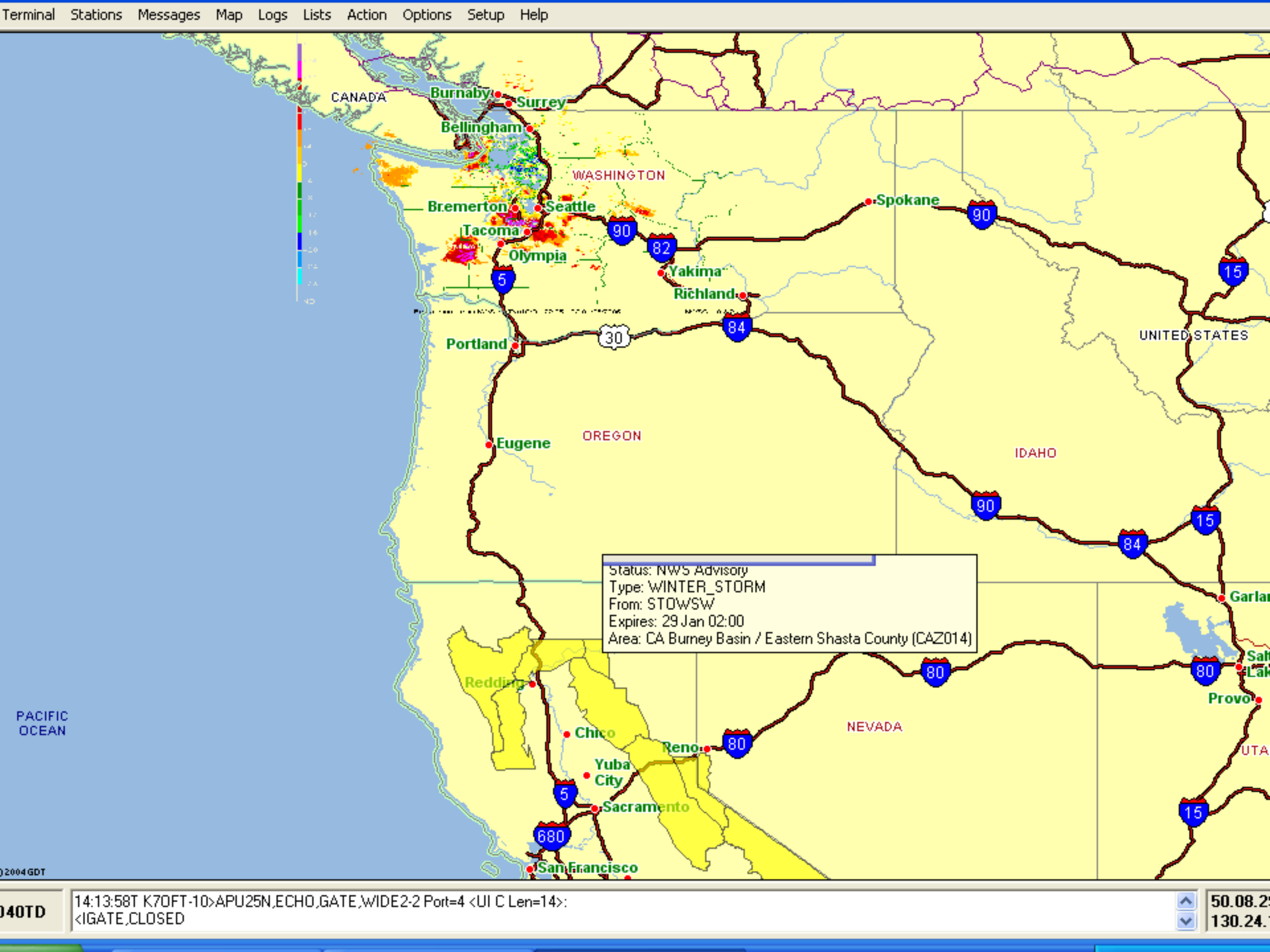
UI-VIEW32

- Developed by Roger Barker, G4IDF *SK**
- Uses Windows OS
- Professional Look
- Sophisticated Features
- Many good ADD-ON’s
- Works with Precision Mapping V7 by undertow software

* No more development. Add-ON's still occurring.



```
13:54:44R KG7V-9>APT310,K3MH-1*,SEA*,WIDE3 Port=1 <UI Len=43>:
/282154z4732.82N/12218.89WU291/010/A=000042
```

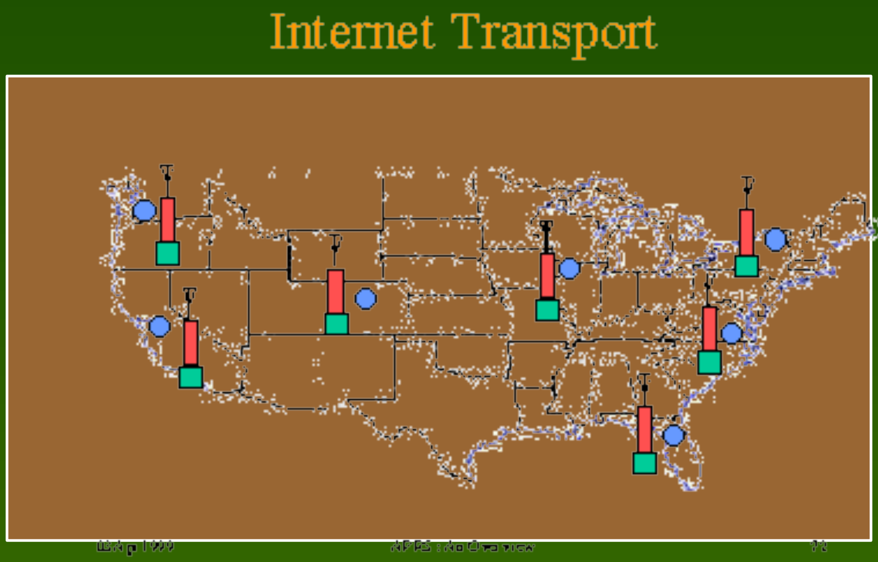


Status: NWS Advisory
Type: WINTER_STORM
From: STOWSW
Expires: 29 Jan 02:00
Area: CA Burney Basin / Eastern Shasta County (CAZ014)

```
14:13:58T K7OFT-10>APU25N,ECHO,GATE,WIDE2-2 Port=4 <UI C Len=14>:
<IGATE,CLOSED
```

APRS on the Internet

- Servers, called iGates, providing views from many major cities across the U.S.
- Point browser to http://www.aprs.net
- Find an APRS station: http://map.aprs.net/*callsign* or http://map.findu.com/callsign



Getting Started With APRS

- Home Station setup
  - Pentium/Celeron preferred Speed >400MHz
  - Terminal Node Controller (TNC) aka radio modem
  - Copy of the applicable software
  - Radio set on APRS freq of 144.39 mhz
  - Suitable antenna for access into NWAPRS system
- Mobile Tracker
  - Radio, TNC, and GPS or add laptop for full APRS mobile station
  - Track yourself or spouse. Great brownie points.

Fixed Station Location

- Upon starting APRS, user supplies location on map for current location.
  - This location is transmitted to other stations on network following a user defined path.
  - No acknowledgment is required.
    - Uses a decaying transmission rate.
    - All stations on local network eventually hear a packet from each station if a path exists.
  - User can define how their station is displayed on map
    - Antenna, Tower, QTH, Car, Jeep, Bus, Plane, dozens more

- With just a PC or Macintosh computer, TNC and radio, you can become active on APRS and tell the local APRS users where you are.

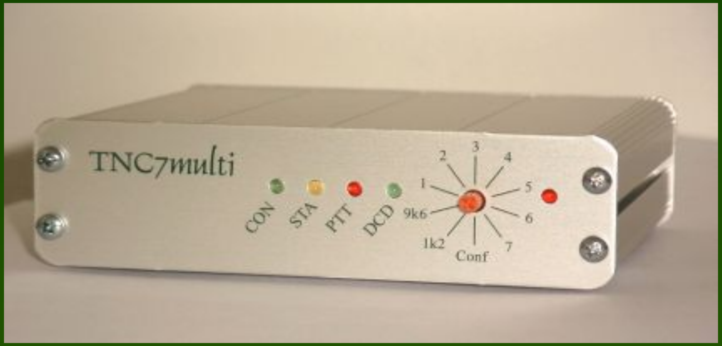
Radios That Work With APRS

- Radio Shack
- Icom
- Kenwood
- Alinco
- Yaesu
- MFJ
- Maxon

GPS Receivers/TNCs for APRS

- GPS
- TNC

Garmin GPS18 Serial
& cigar lighter adapter



IFD TNC7multi

Garmin Etrix & GPS V

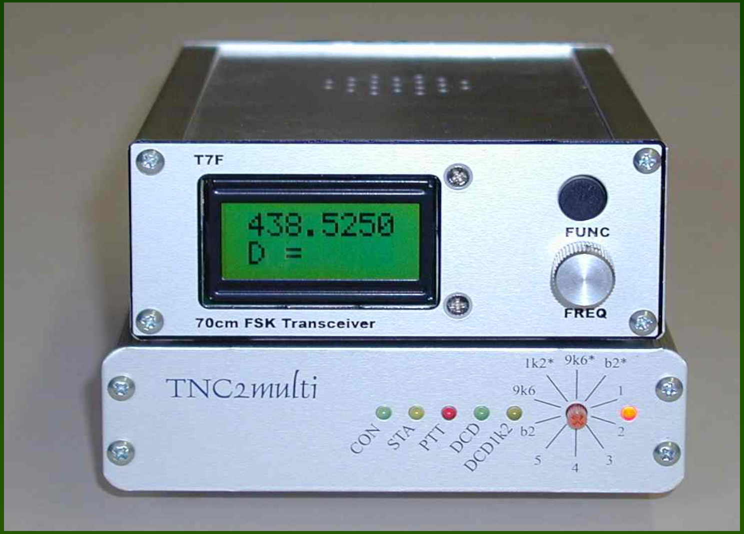
Kantronics KPC-3/KPC-3 Plus

Best Mobile APRS Solution

- Kenwood TM-D700 & Garmin GPS III, V, SP
- APRS activity appears on radio display
- APRS icons appear on GPS III display
- Radio still used for voice comms other side

A GOOD 9600 BAUD SETUP

- DF2FQ TF7 Transceiver
- ***IFD TNC7multi*** TNC
- VERY FAST TXD Times (< 40 ms)
- True G3RUH modulation
- Simultaneous 1k2 & 9k6 reception
- Outstanding receiver sensitivity
- Moderate Cost - Price as shown EU$490. Basic version EU$380

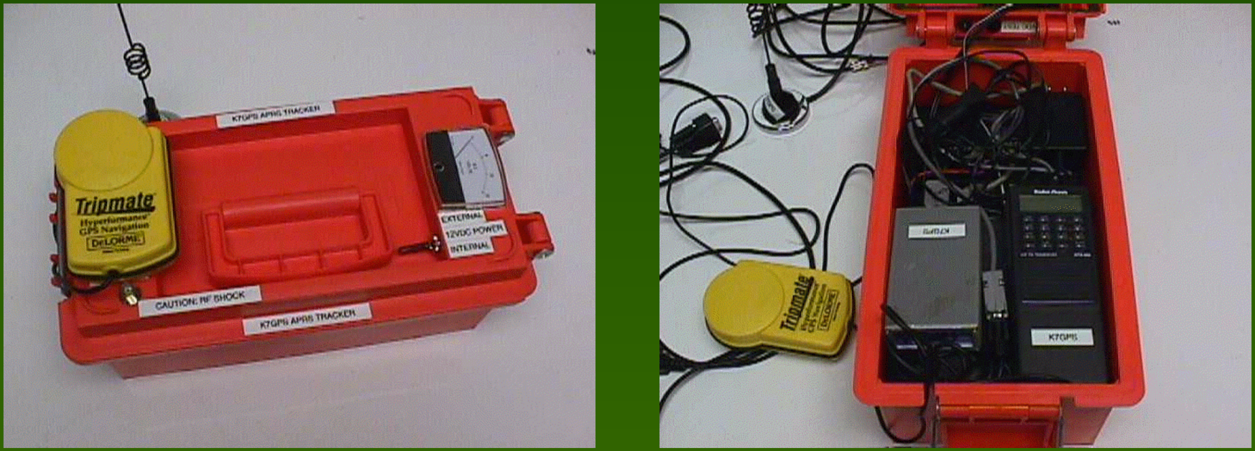


APRS "WIDE" Digipeaters

- Integral part of an effective regional coverage system
- Generally installed at remoted mountaintops
- Digis "relay" signals heard via UI packets
- Use remote function for easy remote programming
- Equipment: Radio, TNC, Antenna, Filtering solution
- Currently about 50 WIDEs part of NWAPRS

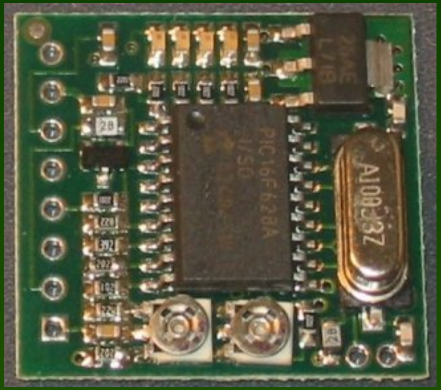
Portable Trackers

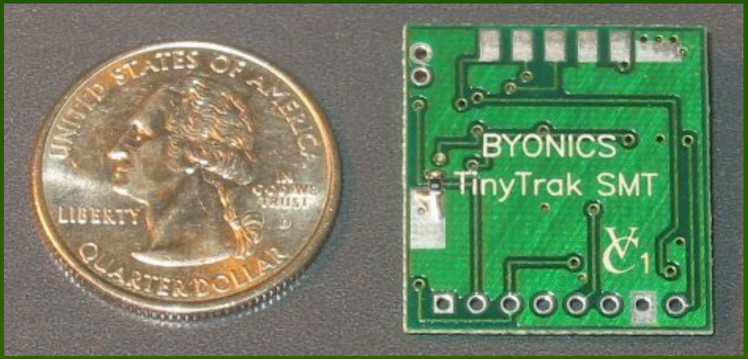
- Self-contained with Radio, TNC, GPS, power
- Useful during public service events where asset tracking is important
- Build trackers applying KISS methodology
  - One switch turns it on, turns it off
- Label the Tracker properly, to avoid confusion



Miniaturizing Components

- Desirable to reduce size and weight of tracker
- Great for Amateur Rocketry, Ballooning, Personal and SAR Dog tracking
- TX side of TNC
- Pic, TinyTrak, Tigertrak, Pocket Tracker, etc





APRS Applications

- Routine station location reporting (aka for FUN!)
- See where Grandpa is in his RV (more FUN)
- Automated weather reporting
- Direction Finding hidden / rogue transmitters
- Severe Weather spotting and locating
- Public Event support
- Disaster Communications Support
- High Altitude Balloon Tracking
- Amateur Rocket tracking
- Grid Square determination

Weather Reporting

- Using a Peet Brothers Ultimeter or Davis Weather Station connected to APRS, data can be transmitted automatically to the entire network.
  - Temperature, Wind Speed, Wind direction, Rainfall, Humidity, Barometric Pressure
- The user can also manually enter:
  - Temperature, wind speed, direction, rainfall
- National Hurricane Center using APRS.
- About 10 WX stations on NWAPRS

Severe Weather Spotting

- The APRS operator can place :
  - Tsunamis
  - Tornadoes
  - Thunderstorms
  - Eruptions
  - Flooding
  - Watches
  - Warnings

- As the status of the object changes, any operator on the network can update the position or status and have the results shown to all operators on the network.

APRS in Search & Rescue

- Man/Dog portable trackers
- Guide search/recovery efforts
- “Visualizes” search picture for IC

Photo used with permission of
GPS World magazine

SAR Dog Tracker Defined

- SAR Dog equipped with APRS tracker
- Position reports rec’d at mobile OSC
- Dog (re)-trained to seek and stay
- IC sees tracker stationary and sends SAR searchers to investigate
- APRS tracker can be used to talk with the victim/subject of the search

APRS in the Emergency Center

- WA, OR State EOCs online 24/7
- WA & OR County EOCs on the air 24/7
- APRS used to pass critical messages during Summer 2000 fire season and Y2K non-event
- One more means of amateur radio service to the community

APRS & Special Events

- Winter Olympics in SLC
- 2000 ALA Big Ride Across America
- March of Dimes Walkathons
- Annual Army/Navy Football Run
- Marathons nationwide
- MS-150 Bike Rides nationwide
- Vancouver Island Challenge
- Road Rallies, Parades, and more

APRS Messaging Features

- APRS “one liners” for point to point or point to group bulletins/announcements
- NTS format supported
- Not primary purpose of APRS, but has become an important integration tool: EWA firefighter updates TXd to WAEOC via APRS when other means failed
- Users can SEND email from APRS console, routed by RF thru area iGate

APRS Frequencies

- VHF/UHF
  - 144.390 MHz - USA & Canada primary VHF frequency
  - 441.825 MHz - Seattle area TCP/IP WetNet
  - 440.875 MHz - Puget Sound area 9k6 Baud
  - 223.400 MHz - Seattle area 1k2 Baud
  - 144.350 MHz - Puget Sound area 1k2 Baud (LPT’s)
- HF
  - 10.151 LSB – Active (10.147.50 USB)
  - 7.085   LSB - Not very active
  - 28.350 USB - Not very active
  - No 6 meter frequency (yet)

APRS Satellite - PCSat

- Launched Sept 2001 from Alaska
- Works in full sunlight only.
- Batteries almost dead.
- Good receiver, low pwr transmiter. Works well.
- Many daily tracks over the PNW

PCsat Afloat Operations Test
CDR Chas Richards W4HFZ (CO)
LTjg Brian Young KC5KLE
ETCS Curtis Mathews N1FDW
ENS Brian Scrabek PCsat design team
TH-D7 APRS HT
PalmPilot Satellite Tracking
USS Parche SSN-683

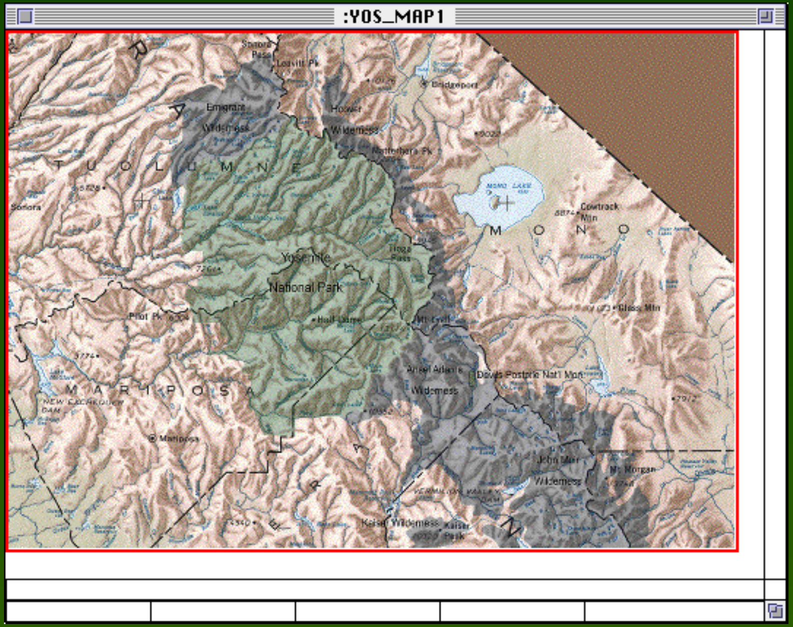
APRS and the WWW

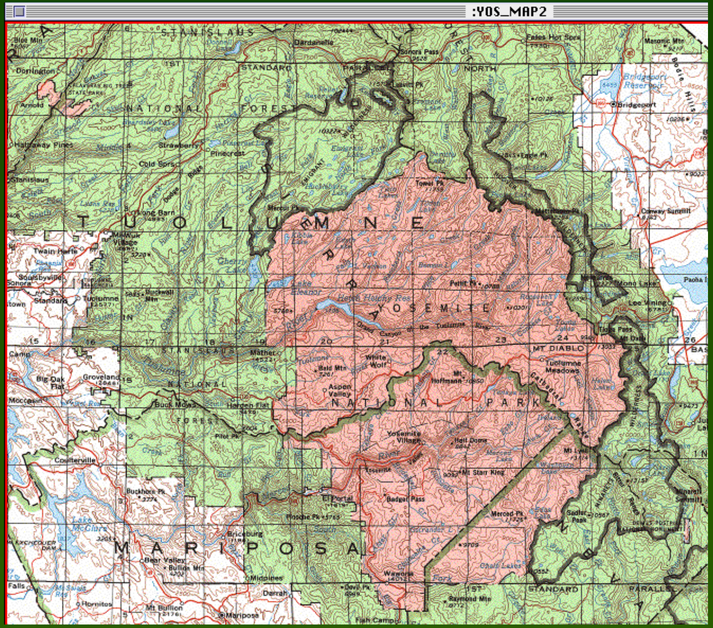
All positions and data distributed over RF is fed onto the APRServer in FL. Any station can be located and tracked via the internet at:
http://map.findu.com/callsign (e.g. K7GPS-9)
Great way for kids to track Grandpa & Grandma while they are RV'ing around the country.

APRS mobiles can SEND email (no receive yet)

APRS & Topo Map Support

Topographic map support for Linux, Windows, Palm, UI-View



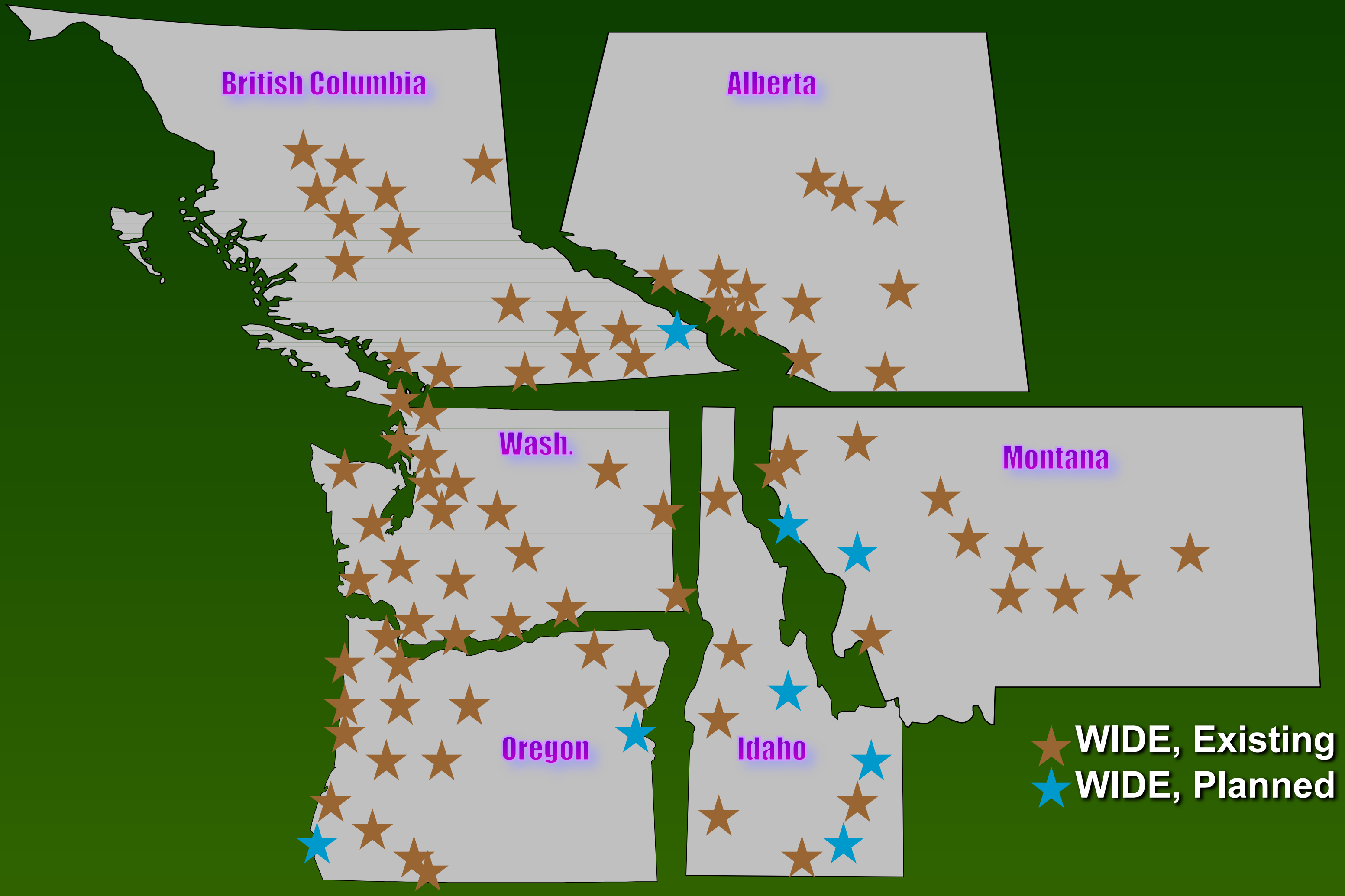


- Integration forthcoming, now requires much manual intervention.
- Will help solidify APRS support to SAR

NorthWest APRS System

- Area of coverage
  - Washington, Oregon, Idaho, Montana, Alberta, and British Columbia
  - Over one million square miles of territory
- Est. 75 WIDE digipeaters, all RELAY,WIDE,TRACE compatible, primarily located near metro areas and primary lines of communication
  - Always looking for new WIDE locations
  - WIDE digipeaters all follow NWAPRS guidelines
- Web page and mailing list (www.nwaprs.org)
- Elmers across the region

NorthWest APRS (NWAPRS)



Homeland Security & APRS

- Ongoing discussions “How can APRS help with the solution of improving homeland security?”
- Answer: Keep doing what we’re doing, and more of it.
- Require all terrorists to wear GPS tracking devices (embedded with small amounts of C4 and radio detonator)

NWAPRS Annual Gatherings

Winter Gathering: 1 day, January, Kelso, WA
Summer Gathering: 3 days, September, North Bend, WA

APRS Wrap-up

- Questions?
- APRS live demo now